

**In the Claims:**

1. (currently amended) An optical device, comprising:

a first conductive layer;

an optical layer, arranged over said first conductive layer, said optical layer being transparent to at least a wavelength of interest and having an index of refraction, which is a function of a variable, substantially reversible, dopant concentration in said optical layer; and

a second conductive layer, arranged over a portion of said optical layer, in accordance with a predetermined pattern;-

a power source, in communication with said first and second conductive layers;

electrical switches, in communication with said power source, each of said electrical switches being in communication with different segments of said second conductive layers, for selectively applying power to different segments of said second conductive layer; and

a control unit, in communication with said electrical switches, for controlling said selectively applying.

2. (original) The optical device of claim 1, wherein a change in said index of refraction of said optical layer, due to a change in said dopant concentration, leads to a change in light absorption of said wavelength of interest, within said optical layer, which is less than substantially 10 %.

3 (canceled).

4. (currently amended): ~~The optical device of claim 3, wherein said at least one power source includes~~An optical device, comprising:

a first conductive layer;

an optical layer, arranged over said first conductive layer, said optical layer being transparent to at least a wavelength of interest and having an index of refraction, which is a function of a variable, substantially reversible, dopant concentration in said optical layer;

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a second conductive layer, arranged over a portion of said optical layer, in accordance with a predetermined pattern; and

at least two power sources, each in communication with said first conductive layer and different segments of said second conductive layers, for selectively applying power to said different segments of said second conductive layer.

5. (canceled)

6. (currently amended) ~~The optical device of claim 3,~~ An optical device, comprising:

a first conductive layer;

an optical layer, arranged over said first conductive layer, said optical layer being transparent to at least a wavelength of interest and having an index of refraction, which is a function of a variable, substantially reversible, dopant concentration in said optical layer;

a second conductive layer, arranged over a portion of said optical layer, in accordance with a predetermined pattern; and

at least one power source, in communication with said first and second conductive layers, for applying an electric potential across said optical layer,

wherein said optical layer has an initial uniform concentration of a dopant, and the application of said electric potential causes a substantially reversible gradient in dopant concentration to be formed, wherein said index of refraction is further a function of said dopant concentration gradient in said optical layer.

7. (currently amended) ~~The optical device of claim 3,~~ An optical device, comprising:

a first conductive layer;

an optical layer, arranged over said first conductive layer, said optical layer being transparent to at least a wavelength of interest and having an index of refraction, which is a function of a variable, substantially reversible, dopant concentration in said optical layer;

a second conductive layer, arranged over a portion of said optical layer, in accordance with a predetermined pattern; and

at least one power source, in communication with said first and second conductive layers,

wherein said optical layer is operative as a first electrode in a chemical cell, and further including:

an ion-storage layer, operative as a second electrode in said chemical cell; and  
an electrolyte layer, sandwiched between said optical and ion-storage layers,

wherein at least one layer selected from the group consisting of said optical layer, said ion storage layer, and a combination thereof, has an initial concentration of dopant, such that there exists a dopant concentration difference between said optical layer and said ion storage layer, and the application of an electric field will cause migration of the dopant between said optical and ion storage layers, resulting in a change in the index of refraction of said optical layer.

8. (original) The optical device of claim 7, wherein said electrolyte layer is operative as a wave-guide, and said optical layer is operative as a Grating Wave-guide Coupler.

9. (currently amended) The optical device of claim 31, wherein said first conductive layer is operative as a wave-guide, and said optical layer is operative as a Grating Wave-guide Coupler.

10. (currently amended) The optical device of claim 31, operative to selectively form and selectively erase a wave-guide, within said optical layer.

11. (currently amended) The optical device of claim 31, operative to selectively form and selectively erase a grating, within said optical layer.

12. (currently amended) The optical device of claim 31, operative to selectively form and selectively erase a plurality of grating sets, within said optical layer.

13. (currently amended) The optical device of claim 31, operative to selectively tune an optical path length to a desired value.

14. (previously presented) The optical device of claim 1, operative as a device selected from the group consisting of a wave-guide switch, a Mach-Zehndler Interferometer, an Array Wave-guide Grating, a Fresnel lens, and a phase pattern for generating a hologram.

15 – 18 (canceled).

19. (original) The optical device of claim 1, wherein said optical layer is formed of a material selected from the group consisting of  $V_2O_5$ ,  $Ta_2O_5$ ,  $MnO_2$ ,  $CoO_2$ ,  $NiO_2$ ,  $Mn_2O_4$ ,  $WO_3$ ,  $TiO_2$ ,  $MoO_3$ ,  $IrO_7$ , a combination thereof, and a combination of the aforementioned oxides with cerium oxide.

20. (original) The optical device of claim 1, wherein said optical layer is formed of silver doped  $RbAg_4I_5$ .

21. (original) The optical device of claim 1, wherein said optical layer is formed of a material selected from the group consisting of silicon, and a silicon compound.

22. (original) The optical device of claim 1, wherein said optical layer is formed of a polymer.

23. (original) The optical device of claim 1, wherein said optical layer is transparent in a range selected from the group consisting of the ultraviolet range of 200 - 400 nm, the visible range of 400 - 800 nm, the near infrared range of 800 - 2000 nm, the mid infrared range of 2000 - 5000 nm, the telecommunication range of 1300 - 1600 nm, and a combination thereof.

24. (currently amended) The optical device of claim 1, wherein said optical layer is transparent in the x,z plane, of an x,y,z coordinate system, wherein x is a lateral direction, y is a vertical direction, and z is a direction along a length of the optical device.

25. (currently amended) The optical device of claim 1, wherein said optical layer is transparent along the y axis, of an x;y;z coordinate system, wherein x is a lateral direction, y is a vertical direction, and z is a direction along a length of the optical device.

26. (original) The optical device of claim 1, wherein said device is transparent in a range selected from the group consisting of the ultraviolet range of 200 - 400 nm, the visible range of 400 - 800 nm, the near infrared range of 800 - 2000 nm, the mid infrared range of 2000 - 5000 nm, the telecommunication range of 1300 - 1600 nm, and a combination thereof.

27. (currently amended) The optical device of claim 1, wherein said device is transparent in the x;z plane, of an x;y;z coordinate system, wherein x is a lateral direction, y is a vertical direction, and z is a direction along a length of the optical device.

28. (original) The optical device of claim 1, wherein said device is transparent along the y-axis, perpendicular to said layers.

29 - 73. (canceled).

74. (currently amended) A method of selectively forming and selectively erasing an optical feature, comprising:

providing an optical device, which comprises:

a first conductive layer;

an optical layer, arranged over said first conductive layer, said optical layer being transparent to at least a wavelength of interest and having an index of refraction, which is a function of a dopant concentration in said optical layer; and

a second conductive layer, arranged over a portion of said optical layer; and

applying an electric potential between said first and second conductive layers, thus causing a reversible change in said index of refraction within said optical layer

between said portion and the remainder of said optical layer, while maintaining a change in light absorption of said wavelength of interest, within said optical layer, at  $\pm 10\%$ .

75. (canceled).

76. (currently amended) A tunable optical filter, comprising:  
alternate strata of indices of refraction of  $n_1$  and  $n_2$ , said  $n_1$  and  $n_2$  being substantially different from each other;  
conductive layers, arranged along the midst of each stratum; and  
electrolyte layers, arranged between each of said stratum;  
wherein said tunable filter is transparent to at least a wavelength of interest in the y direction, of an x,y,z coordinate system, wherein x is a lateral direction, y is a vertical direction, and z is a direction along a length of the tunable optical filter;  
and wherein at least one tunable index of refraction, selected from the group consisting of  $n_1$ ,  $n_2$ , and both  $n_1$  and  $n_2$ , is a function of a variable, substantially reversible, dopant concentration of its associated stratum.

77 - 91 (canceled).

92. (currently amended) A method of producing a tunable filter, comprising:  
arranging alternate strata of indices of refraction of  $n_1$  and  $n_2$ , said  $n_1$  and  $n_2$  being substantially different from each other, wherein at least one index of refraction, selected from the group consisting of said  $n_1$ , said  $n_2$ , and said  $n_1$  and  $n_2$ , is a function of a variable, substantially reversible, dopant concentration of its associated stratum;  
arranging conductive layers, along the midst of each stratum;  
arranging electrolyte layers, between each of said stratum; and  
applying potential differences of alternating polarities to said conductive layers, wherein by said application, a migration of dopant across said electrolyte layers takes place, thus tuning said at least one tunable index of refraction.

93. (canceled).

94. (currently amended) A tunable optical filter, comprising:

a stack of optical layers, said optical layers being transparent to at least a wavelength of interest and having an index of refraction, which is a function of a variable, substantially reversible, dopant concentration gradient in said optical layerlayers; and

conductive layers, arranged between said optical layers.

95 – 108 (canceled).

109. (original) A method of producing a tunable filter, comprising:

stacking optical layers, said optical layers being transparent to at least a wavelength of interest and having an index of refraction, which is a function of a variable, substantially reversible, dopant concentration gradient in said optical layers;

arranging conductive layers, between said optical layers; and

applying potential differences of alternating polarities to said conductive layers, wherein by said application, a concentration gradient of dopant is formed within said optical layers, thus tuning said filter.

110. (canceled).